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Incidence, Diagnosis, and Treatment of Enteric and Colorectal Fistulae in Patients with Crohn's Disease

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Objective

The authors review their experience, evaluating the incidence and examining the various modalities employed in the diagnosis and treatment of patients with Crohn's disease complicated by fistulae.

Summary Background Data

Although common, internal and external fistulae in Crohn's disease may pose challenging problems to the surgeon.

Methods

Of 639 patients who underwent surgical treatment at the University of Chicago between 1970 and 1988 for complications of Crohn's disease, 222 patients (34.7%) were found to have 290 intra-abdominal fistulae.

Results

A fistula was diagnosed preoperatively in 154 patients (69.4%), intraoperatively in 60 (27%), and only after examination of the specimen in 8 (3.6%). The fistula represented the primary or single indication for surgical treatment in 14 patients (6.3%) and one of several indications in the remaining patients. Of 165 patients with an abdominal mass or abscess, 69 (41.8%) had a fistula. All patients underwent resection of the diseased intestinal segment; 160 (73.1%) with primary anastomosis and the remaining 62 with a temporary or permanent stoma. The fistula was directly responsible for a stoma in only 16 patients (7.2%) and was never responsible for a permanent stoma. Resection of the diseased bowel achieved *en bloc* removal of the fistula in 145 cases. Removal of 93 additional fistulae required resection of the diseased bowel segment along with closure of a fistulous opening on the stomach or duodenum (n = 14), bladder (n = 35), or rectosigmoid (n = 44). When the fistula drained through a vaginal cuff (n = 4), the opening was left to close by secondary intention; when the fistula opened through the abdominal wall (n = 46), the fistulous tract was debrided. In the remaining two entero-salpingeal fistulae, *en bloc* resection of the involved salpinx accomplished complete removal of the fistula. There was a dehiscence of one duodenal and one bladder repair; 14 patients (6%) experienced postoperative septic complications and one patient died.

Conclusions

Fistulae are diagnosed preoperatively in 69% of cases and can be suspected in as many as 42% of patients with an abdominal mass. Fistulae are the primary or single indication for surgical

treatment and are directly responsible for a stoma only in a few patients. Treatment, based on resection of the diseased bowel and extirpation of the fistula, can be accomplished with minimal morbidity and mortality.

Fistulae, common complications of Crohn's disease, result from full-thickness disease rupturing into an adjacent hollow viscus or through the abdominal wall. Recognized early by Crohn,[1] fistulae reportedly occur in about 30% of patients.[2-5] Although they occur commonly, internal and external fistulae in Crohn's disease may pose challenging problems to the surgeon. In this review of our experience, we evaluate the incidence and examine the various modalities employed in the diagnosis and treatment of patients with Crohn's disease complicated by fistulae.

MATERIALS AND METHODS

Between January 1, 1970, and December 31, 1988, 639 patients required at least one operative procedure for complications of Crohn's disease at the University of Chicago Medical Center.[6] Two hundred twenty-two patients (34.7%) were found to have at least 1 intra-abdominal fistula and constitute the data base for this retrospective analysis.

The clinical records of all these patients were reviewed. Data regarding age at operation, sex, location of disease, symptoms, preoperative diagnostic tests, type of operation, intraoperative findings (presence of abscess, perforation, mass, and obstruction), and perioperative morbidity and mortality were specifically sought in each instance. When appropriate, radiographic documentation was retrieved to clarify site of disease and extension of fistula.

An effort was made to determine precisely the primary indication for surgical treatment in each case. However, because this was a retrospective study and because more than one indication appeared to have played a role in the final decision to operate, a precise determination was not always possible. Table 1 summarizes the prioritization scheme used in determining the primary indications for surgery.

RESULTS

Six hundred thirty-nine patients (322 men and 317 women) required surgical intervention for their Crohn's disease during the 19-year period under consideration. Two hundred ninety intra-abdominal fistulae were found in 222 patients (34.7%; 121 men and 101 women). Most of these patients (128 or 58%; mean age, 30.7 years) were operated on for primary disease, while the remaining patients (94; mean age, 33.3 years) required operation for recurrent disease. The latter group was comprised of patients with complicated clinical courses requiring reoperation for the second to fourth time.

Fistulae were diagnosed preoperatively in 154 (69.4%) patients by a combination of history and physical examination, radiographic investigation, and endoscopic procedures. In the remaining patients, a fistula was discovered intraoperatively in 60 cases (27%) or only after careful examination of the specimen in 8 (3.6%). Timing of diagnosis is displayed in Table 2 according to the total number of fistulae.

Most patients had symptoms or findings related to the worsening of their Crohn's disease (*e.g.*, anorexia, fatigue, and weight loss) or to the development of septic or obstructive complications (*e.g.*, fever, abdominal pain, and diarrhea). Only a few patients had symptoms or findings that were suggestive or diagnostic of a particular fistula. Specifically, 25 of 36 patients with entero-vesical

Table 1. PRIMARY INDICATION FOR SURGERY*

Inflammatory mass or abscess
Intestinal obstruction (partial or complete)
Fistula: considered an indication for surgery if one of the following was present
Drainage was a matter of personal embarrassment (*e.g.*, enterocutaneous or enterovaginal fistula)
Fistula communicated with the genito-urinary system (*e.g.*, entero- or colo-vesical fistula)
Fistula produced functional or anatomic bypass of a major segment of intestine with consequent malabsorption and/or profuse diarrhea (*e.g.*, duodeno-colic or entero-rectosigmoid fistula)
Obstipation
Failure of medical treatment: considered an indication for surgery if one of the following was present
Corticosteroid therapy inadequate to control patient symptoms
Recurrence of symptoms with tapering from high-dose corticosteroids
Worsening symptoms or new onset of complications while on maximal medical therapy
Occurrence of steroid-induced complications (Cushingoid features, cataracts, glaucoma, systemic hypertension, aseptic necrosis of the head of the femur, myopathy, or vertebral body fractures)

* The indications are listed in descending order of priority of classification as the primary surgical indication. If more than one indication was present, then the indication with the higher priority was determined to be the primary indication.

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Table 2. TIMING OF DIAGNOSIS

Location of Fistula	Total No.	Preoperatively: History and Physical Exam (n)	Preoperatively: Radiological or Endoscopic Studies (n)	Preoperatively: Cumulative No.	Preoperatively: Cumulative %	Intraoperatively or Postoperatively No.	Intraoperatively or Postoperatively %
Enterocolic-gastroduodenal	14	1	11	11	79	3	21
Entero-enteric	51	0	18	18	35	33	65
Entero-R colic	83	0	32	32	40	51	60
Colo-sigmoid	5	0	3	3	60	2	40
Entero-sigmoid/rectal	49	0	15	15	31	34	69
Entero-salpingeal	2	0	0	0	0	2	100
Entero-vesical	36	25	18	25	69	11	31
Entero-cutaneous	46	46	32	46	100	0	0
Entero-vaginal	4	4	2	4	100	0	0
Total	290	76	131	154	69	136	31

fistulae had pneumaturia and/or fecaluria, and all patients with an entero-cutaneous or entero-vaginal fistula had an obvious external enteric drainage.

Table 3 lists the indication for surgical treatment in all patients with a fistula. A fistula represented the single indication for surgical treatment in only 14 patients (6%). Failure of medical treatment was the most common indication, followed by partial or complete intestinal obstruction, obstipation, inflammatory mass, and intra-abdominal abscess. At operation, 165 of the 639 patients were found to have an abdominal abscess or inflammatory mass; of these, 69 (41.8%) had a fistula.

All patients underwent an intestinal resection, with primary anastomosis in 160 (73%) and a temporary or permanent stoma in the remaining 62 patients. Temporary stomas were necessary because of local considerations (*e.g.*, intra-abdominal sepsis or inadequate bowel preparation) or generalized conditions (*e.g.*, malnutrition and debilitation). The need for a permanent stoma was invariably dictated by the severity and extension of the disease to the anorectum. Fistulae were responsible for a temporary stoma only in 16 patients (7%). All 16 patients had an ileo-sigmoid or ileo-rectal fistula that was treated with a resection of the terminal ileum and primary closure of the sigmoid/rectal opening. The temporary stoma was fashioned to protect the closure in the presence of extensive pelvic contamination or sigmoid/rectal wall inflammation. Fistulae were never responsible for a permanent stoma.

Table 4 outlines the location of all 290 fistulae. Most fistulae (83%) were internal and connected the intestine with a hollow viscus lined by adenomatous or transitional epithelium. Of these, the most common were en-

Table 3. PRIMARY INDICATION FOR SURGICAL TREATMENT IN 222 PATIENTS WITH CROHN'S DISEASE COMPLICATED BY AN INTRA-ABDOMINAL FISTULA

Primary Indication*	No.
Presence of inflammatory mass or abscess	25 (12%)
Intestinal obstruction (partial or complete)	65 (29%)
Fistula	14 (6%)
Obstipation	40 (18%)
Failure of medical treatment	78 (35%)

* See Table 1 for prioritization scheme.

Table 4. LOCATION OF 290 INTRAABDOMINAL FISTULAE IN 222 PATIENTS OPERATED ON FOR COMPLICATIONS OF CROHN'S DISEASE

Location	No.
Internal	
Entero-duodenal	14 (5%)
Entero-enteric	51 (18%)
Entero-colonic	83 (29%)
Entero-sigmoid	49 (17%)
Entero-vesical	36 (12%)
Colo-sigmoid	5 (2%)
Entero-salpingeal	2 (2%)*
Total internal	240 (83%)
External	
Entero-cutaneous	46 (16%)
Entero-vaginal	4 (4%)*
Total external	50 (17%)
Total fistulae	290

* The percentage is based on the number of fistulae in women.

tero-colonic fistulae, followed by entero-enteric and entero-sigmoid. The remaining fistulae were external and connected the intestine with an organ lined by squamous epithelium. The most common external fistulae were entero-cutaneous. Below we describe the clinical presentation and course, by location, for the patients found to have fistulae.

Fourteen patients had fistulae with the stomach or duodenum. Preoperative diagnosis of a duodenocolic fistula was suggested in one patient who had repeated episodes of feculent emesis. A preoperative diagnosis was confirmed or achieved with barium enema and/or upper gastrointestinal series in 11 patients. In the remaining three patients the presence of the fistula was confirmed or diagnosed at the time of laparotomy (Table 2). Eight of the patients had undergone a previous resection of the terminal ileum with an ileo-ascending or ileo-transverse anastomosis; at surgery the fistula was found to be originating from disease in the neo-terminal ileum. In the remaining six patients who had not undergone previous intestinal resection, the fistulae originated from the cecum in one case and from the transverse colon in five cases. The fistulae opened in the first (n = 2), second (n = 3), and fourth (n = 1) portions of the duodenum, respectively. In all cases the disease in the terminal ileum and the colon was treated according to its own characteristics, and the defect in the wall of the duodenum was treated by debridement and simple closure. The duodenal closure was reinforced with an omental flap in six patients. Temporary decompression of the duodenum was obtained in all cases by a combination of nasogastric, duodenal, or jejunostomy tubes. The duodenal closure healed uneventfully in all but one patient. In this patient, a partial dehiscence was complicated by marked sepsis and, eventually, death.

Eighteen of 51 entero-enteric fistulae were diagnosed preoperatively with a small bowel series. Forty-one of these (80%) were completely resected with the diseased bowel. In the remaining ten cases, when the fistula drained into a distant loop of small bowel and an *en bloc* resection would have led to sacrifice of large amounts of gross normal intestine, the uninvolved intestine was detached from the diseased segment by transecting the fistula. The bowel resection was then limited to the involved segment and the defect left by severance of the fistula from the normal intestine was usually debrided to well-perfused tissue and closed using a double layer technique.

Thirty-two of 83 entero-right colic fistulae and 3 of 5 colo-sigmoid fistulae were diagnosed preoperatively with a barium enema or small bowel series. All entero-right colic and colo-sigmoid fistulae were removed *en bloc* with the specimen.

Forty-nine patients had an ileo-sigmoid fistula. In only 15, the fistula was accurately diagnosed preoperatively by a small bowel series or barium enema. In 44 cases, the defect in the sigmoid wall was debrided and closed primarily. In the remaining five cases, a wedge or segmental sigmoid resection was necessary because the sigmoid wall was inflamed, thickened, and rigid (two cases); debridement of the edges of the fistula resulted in a large defect in the sigmoid wall (two cases); and the opening of the fistula was on the mesenteric side of the sigmoid where primary closure was difficult to obtain (one case). In 16 patients a temporary stoma (terminal ileostomy or transverse loop colostomy) was fashioned to protect the sigmoid closure.

Thirty-six patients had an entero-vesical fistula. A clinical diagnosis was suspected in 25 patients because of a history of pneumaturia and/or fecaluria (Table 2). Further diagnostic work-up was not as sensitive. Small bowel radiographs demonstrated the fistula in only 3 patients, barium enemas in only 6, cystogram in only 6 of 25, and cystoscopy in 15 of 27. At operation, the bladder wall defect was debrided and closed primarily. All repairs were drained with a closed-suction drain and an indwelling catheter (n = 35) or a suprapubic drainage tube (n = 1). In 26 patients, the urinary drainage catheter was removed after a cystogram demonstrated complete healing of the bladder repair between 5 and 7 days after the surgical procedure. In the remaining ten patients, the decision to remove the urinary catheter was based on clinical findings only. One patient experienced a partial bladder repair dehiscence with urinary extravasation. Continuous suction drainage for 12 days and urinary drainage for 2 weeks allowed bladder closure.

Forty of 46 entero-cutaneous fistulae drained spontaneously through a previous abdominal scar. In the remaining cases, incision and drainage of a subcutaneous extension of an intra-abdominal abscess created an enterocutaneous fistula. In case of entero-cutaneous fistulae, the diseased portion of intestine was resected and the fistulous tract was debrided.

Entero-vaginal fistulae were present in four female patients, all of whom had previously undergone a hysterectomy. The fistulous opening could be demonstrated with a speculum examination in all four patients. In two patients the fistula could be demonstrated with an enteroclysis as well (Table 2). The introduction of a vaginal tampon helped in the detection of barium in the vagina. The patients underwent resection of the diseased small bowel and, when necessary, drainage of an intervening pelvic abscess. The opening in the vaginal cuff was usually small and did not required suturing. Two entero-salpingeal fistulae were resected *en bloc* with the diseased intestinal segment by including the involved salpinx in the specimen.

One patient died during the postoperative period, for

a hospital mortality rate of 0.4%. Septic complications, such as wound infection (3.2%), abdominal abscess (3.2%), and intestinal obstruction (3.6%), were the most common postoperative complications.

DISCUSSION

Prevalence and Presentation

One-third of all patients operated on for Crohn's disease at our institution during a 19-year period had intestinal fistulae. An accurate physical examination was enough to diagnose all entero-cutaneous and entero-vaginal fistulae (Table 2). Twenty-five of 36 (69%) patients with entero-vesical fistulae had pneumaturia and/or fecaluria, symptoms that are so characteristic as to be diagnostic of the presence of an entero-vesical fistula. In the remaining 147 patients with internal fistulae, preoperative radiologic or endoscopic examinations accurately diagnosed the presence of at least a fistula in 79 (54%) patients, with a sensitivity ranging from 0% to 79% depending on the location of the fistula. For example, entero-enteric fistulae were never symptomatic, and only one-third were discovered or suspected preoperatively on contrast barium studies. The remaining 68 fistulae were discovered at the time of operation or only after a careful examination of the resected specimen.

Only six fistulae to the duodenum and five to the colon originated from the large bowel; in the remaining 211 patients (95%), fistulae started from the small bowel (Table 2). Considering that only 332 of 639 patients had disease involving the small bowel, 64% of these patients had at least 1 fistula. It follows that most patients with Crohn's disease to the small bowel have intra-abdominal fistulae and that intra-abdominal fistulae are almost limited to patients with small bowel disease.

Our experience with rare fistulae was similar to that reported by others. Among patients with entero-duodenal fistulae, which occurred in only 5%, the duodenum was not primarily involved by Crohn's disease. This finding is consistent with published cases. Among the fewer than 100 cases reported in the English literature,[7-11] only 1 was reported to have histologic evidence of duodenal Crohn's disease.[9] In our series, entero-duodenal fistulae occurred with almost equal frequency in primary and recurrent disease; in primary Crohn's disease they originated from diseased colon, and in recurrent Crohn's disease they originated from disease at the ileo-colonic anastomosis.

The four patients who had entero-vaginal fistulae all had previously undergone a hysterectomy. This observation is in agreement with the experience of other authors.[12] Moreover, our observation that entero-cutaneous fistulae most often drained through a previous abdominal scar is consistent with the report of others.[3]

Although fistulae are common in patients with Crohn's disease, they represent the single indication to surgical treatment in a few cases. In our experience, we have considered surgical intervention necessary because of a fistula only when (1) the fistula has produced a functional or anatomic bypass of a major segment of intestine with consequent malabsorption and/or profuse diarrhea; (2) the fistula communicates with the genito-urinary system; or (3) the drainage is a matter of personal embarrassment. For example, for the four patients who had entero-vaginal fistulae, the vaginal discharge caused discomfort, social and sexual embarrassment, and difficulty in maintaining personal hygiene. All of these patients demanded treatment of this condition and readily accepted a recommendation for operation.

In all other cases the indication for the surgical treatment is more commonly represented by the presence of an inflammatory mass or abscess, by a partial or complete intestinal obstruction, or by failure of medical treatment (see Table 3). Nevertheless, fistulae may be present when other complications are present. Indeed, 42% of patients found to have an inflammatory mass or abdominal abscess at operation had a simultaneous intra-abdominal fistula.

Surgical Management and Outcome

The appropriate surgical management of Crohn's intra-abdominal fistulae follows the principle of resection of the primary disease with extirpation of the fistula. Location of the fistula in the bowel, local considerations, and generalized condition influence whether a temporary stoma is necessary. In our experience, temporary stomas have always followed treatment of an ileo-sigmoid or ileo-rectal fistula. After the terminal ileum has been resected and the opening on the sigmoid wall has been closed primarily or with a wedge resection, a temporary stoma such as a terminal ileostomy or a transverse loop colostomy was necessary in the presence of pelvic sepsis, inadequate bowel preparation, or malnutrition. The need for a permanent stoma was always dictated by the extension of the disease to the rectum and anus, rather than by the presence of an abdominal fistula.

Although the appropriate surgical management of entero-duodenal fistulae follows the principle of resection of the primary disease with extirpation of the fistula and closure of the duodenal defect, controversy exists on how the duodenal closure should be managed. Pettit and Irving[11] have proposed to routinely protect duodenal repairs by applying a serosal patch to cover the defect. With this technique, the serosa of a jejunal loop is sutured to the healthy duodenal serosa surrounding the duodenal repair. They also prefer the serosal patch technique for

defects that are not suitable for primary closure because of edema or friability of the duodenal wall. In these cases, others[13] advocate closure of the duodenal defect with a duodeno-jejunostomy or with a Roux-en-Y loop. In our experience, a primary closure has always been feasible, although, when the duodenal defect is close to the pancreatic border, a tedious and meticulous dissection is necessary to mobilize healthy duodenal wall from the pancreas. Temporary decompression of the duodenum by the use of nasogastric, duodenal, or retrograde jejunostomy tubes represents an important adjunct to the duodenal closure.

In most cases, entero-enteric fistulae can be treated by *en bloc* resection with the diseased intestinal segment. In the remaining instances, when this approach leads to excessive sacrifice of uninvolved intestine, the normal-appearing loops need to be separated from the diseased segment, exercising care to contain or minimize contamination of the operative field due to transection of fistulae or opening of interloop abscesses. The resulting defect in the intestinal wall is closed with meticulous technique after debriding its edges to healthy tissue.

Ileo-cecal and ileo-right colonic fistulae, which were the most common fistulae encountered in our experience, lent themselves readily to *en bloc* resection with the diseased intestinal segment. When an ileo-rectosigmoid fistula was present, the sigmoid was involved because of its proximity, but it was otherwise not affected by Crohn's disease. Fazio et al.[14] advocated resection of both terminal ileum and sigmoid in the treatment of such fistulae. We do not agree with Fazio et al. and believe that the defect through the sigmoid wall can be closed primarily after debridement of its edges in most cases. However, a sigmoid resection is necessary if there is evidence of primary Crohn's disease in the sigmoid colon, if the intestinal wall is inflamed, thickened, and rigid, if debridement of the edges of the fistula results in a large defect in the sigmoid wall, and, finally, if the opening of the fistula is on the mesenteric side of the sigmoid where primary closure may be difficult.

Some controversy exists regarding the timing of surgical intervention in the presence of entero-vesical fistulae. Nevertheless, most surgeons and gastroenterologists agree that the consequences of chronic urinary tract infections on renal function, in addition to the symptoms of the intestinal disease itself,[15,16] represent an indication for operation. Once again, surgical treatment is based on resection of the diseased segment of intestine with extirpation of the fistulous tract. The opening in the bladder is usually located at the dome and, therefore, the necessary debridement and primary closure can be affected without danger to the trigone. After repair, the bladder is drained for several days with an indwelling catheter, which is removed after radiologic confirmation that the bladder repair has healed. A closed suction drain is placed at the time of operation in proximity to the bladder repair to drain any urine that may extravasate.

The presence of an entero-cutaneous fistula does not necessarily dictate the need for immediate surgical intervention. Occasionally, patients may be reluctant to undergo surgical treatment, either when the entero-cutaneous fistula has a minimal output and the underlying disease is under satisfactory control, or when the cutaneous opening of the fistula drains near an intestinal stoma and can be incorporated into the stoma appliance. However, in our patients, the difficulty in maintaining personal hygiene and the fear of social embarrassment, the bothersome symptoms associated with the severely diseased segment that led to the formation of the fistula, and the skin excoriation around the cutaneous opening of the fistula all became factors in indicating the need for surgical treatment and in facilitating the acceptance of surgical treatment by the patient. Surgical treatment of an entero-cutaneous fistula is based on resection of the diseased intestinal segment, extirpation of the fistula, and debridement of the fistulous tract through the abdominal wall and subcutaneous tissue. At times this translated into several subcutaneous fistulotomies, which are left to heal by secondary intention.

The surgical treatment of an entero-vaginal fistula involves resection of the diseased bowel with extirpation or debridement of the fistulous tract, and drainage of any intervening abscesses. The opening into the vaginal cuff is usually small and located in the center of an area of induration and inflammation. In our cases it was never sutured and invariably it closed by secondary intention.

Entero-salpingeal fistulae are rare, as attested by only one report describing one enteric fistula to the right Fallopian tube and one enteric fistula to the uterus.[17] In both of our cases they were incidental findings at exploratory laparotomy and were dealt with by *en bloc* resection.

Despite preoperative malnutrition and high doses of exogenous steroids, morbidity and mortality were limited. The incidence of postoperative wound infections and abdominal abscesses was minimized by routinely adhering to steps to contain contamination of the abdominal wound and peritoneal cavity. Early on during the course of the operative procedure, the edges of the incision were protected with towels or, preferably in more recent years, with impermeable, impervious wound protectors. The uncontaminated peritoneal cavity was walled off with laparotomy pads and, when possible, the intestinal lumen was occluded proximally and distally to a fistula with non-crushing clamps before severing any fistulous tract. After incising the fistula, the intraluminal material was suctioned to avoid uncontrollable spillage.

Only 1 of 222 patients died in the postoperative pe-

riod. In this patient a partial dehiscence of a duodenal closure was complicated by sepsis and, eventually, death. Although primary duodenal closure with endoluminal decompression is usually feasible, other maneuvers such as omental or peritoneal patch, side-to-side duodeno-jejunostomy, or an Roux-en-Y should be used to protect a difficult primary closure or to avoid a primary closure when local conditions render it inadvisable.

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